

## MATH 631

### Algebraic geometry I: Introduction to algebraic varieties

- MWF 1:00-2:00 PM, EH 4096
- Course webpage: [www.math.lsa.umich.edu/~mmustata/631.html](http://www.math.lsa.umich.edu/~mmustata/631.html)
- Office hours: Tuesdays 11:00-12:00, and by appointment.
- There will be a one hour weekly problem session run by Alan Stapledon (day and time to be decided). I will distribute the problem sheets a few days in advance, so you have time to look over them. There will be also a weekly homework assignment, and the grade will be based on the homework.

The goal of the course is to introduce the basic notions about algebraic varieties. Here is a rough outline.

- 1) Affine algebraic subsets, Noether's Normalization Theorem and Hilbert's Nullstellensatz.
- 2) Sheaves and ringed spaces. Algebraic prevarieties. Morphisms. The analytic space associated to a complex algebraic variety.
- 3) Projective varieties.
- 4) Separatedness and completeness.
- 5) Dimension theory.
- 6) Bézout's Theorem.
- 7) Normal and nonsingular varieties. Differentials and the tangent bundle. Bertini's Theorem. Generic Smoothness.

In parallel with developing the technical background, we will try to spend time on examples, concrete constructions, and special classes of algebraic varieties (such as projective bundles, Grassmannians and flag varieties, determinantal varieties, linear algebraic groups, abelian varieties, and toric varieties).

There is no textbook for this course, but here are some references that you might find helpful:

- 1) R. Hartshorne, Algebraic Geometry, Chap. I.
- 2) D. Mumford, The Red Book of Varieties and Schemes.
- 3) J. Harris, Algebraic Geometry: A First Course.